Progress report for ENE14-133 - Integrated pest management for greenhouse vegetable producers

Project Information

Performance Target:

The objective of this project is to provide training for Extension educators in IPM that is tailored for the production system and specific pests in vegetable production under protected environments (greenhouses and high tunnels). The intent is that this will lead to an increase in the adoption of IPM by growers, with its potential to reduce pesticide use and improve product quality.

Overall performance targets: 20 Extension educators will co-train with growers in greenhouse vegetable IPM to provide grower support; 10 will conduct educational programming for 150 growers; 8 will create an IPM plan with a grower then demonstrate it for 160 growers. Thirty growers will document an increase in IPM in their vegetable greenhouses.

Cooperators

Brian Eshenaur (Educator)
Amy Ivy (Educator)
Dr. Elizabeth Lamb (Educator)
Judson Reid (Educator)
Barb Neal

Educational Approach

As this project encourages education at several levels, we have tried to include a variety of educational approaches within the project. Training for Extension educators includes archived webinars to allow visual, and repeatable, training. This is coupled with resources that relate to the webinar topics as well as other topics requested by the educators that can be accessed as needed. A face-to-face discussion based training program is included to help develop support among educators and other resource people. Training for growers by educators is by the more traditional seminar talk and question approach but presented with a greenhouse tour to encourage more discussion and experiential learning.

Milestone #1

1) 80 Cornell Cooperative Educators will learn about the Greenhouse Vegetable IPM training program.

Accomplishments:

We created an on-line survey in Qualtrics to be distributed to CCE educators who cover a broad range of expertise areas. We included the 3 regional Extension teams that cover multiple counties – Eastern NY Commercial Horticulture Program, Capital Area Ag and Hort Team, and the Cornell Vegetable Program – which all include some vegetable specialists. We also included lists of county-based educators who work with commercial and consumer horticulture. In total, the survey was sent to 85 CCE educators (there may have been a few duplications).

With the survey, we sent a description of the project, the planned webinars, and the hands-on workshop. We started with the educators in NYS as we have better connections with them and thought they might be more likely to return the surveys. In the future, we will contact educators in neighboring states in the region to determine how we might provide the same information to them.

Milestone #2

2) 30 Extension educators will return survey on current level of knowledge, desired topics, and regional programming needs.

Accomplishments:

We received 24 responses, including educators from 16 counties and 2 regional teams. They reported a variety of areas of expertise or work – 5 in Consumer Hort, 3 in vegetable crops, 3 in Natural Resources, 2 in ornamentals, 2 in general agriculture or horticulture, and 3 in various areas. Seventy eight % work with GH/HT growers of vegetables (7) or ornamentals (2), or both (9). An additional 6 said they don't currently work with these growers but are interested in learning more.

The primary topics to be covered in the webinars and as part of creating an IPM plan are: vegetable crops produced in GH/HT, production factors for this type of production, and insect, disease and weed management in GH/HT vegetable production. While 46% of respondents said their knowledge of the crops was medium, the majority rated themselves as having low knowledge of the topics covered by the project:

Production factors for GH/HT vegetable production 46%

Insect management in GH?HT vegetable production 54%

Disease management in GH/HT vegetable production 63%

Weed management in GH/HT vegetable production 42%

At least 70% indicated each of these topics to be of potential interest to them:

Basics of light, water, fertility, and media in a GH/HT	87%
Vegetable crop production in GH/HT	75%
Insect management in GH/HT vegetable production	79%
Disease management in GH/HT vegetable production	75%
Weed management in GH/HT vegetable production	71%
Case studies from successful growers	75%

Other things suggested (some of which don't fit into this project but that we can find resources for) were specialty crops, low tunnels, and business plans.

We asked what other information they felt they would need to be successful in assisting growers with pest management issues in GH/HT vegetable production. Their answers included: cover crops, pesticides labeled for use on edible crops in GH/HT and efficacy data, a definition of GH/HT in respect to pesticide use, fertigation basics, water management, economics – when is it worth it, other crops – small fruits, figs, ginger, and understanding differences in production under the different environments of field and GH/HT.

We asked for estimates of the number of GH/HT vegetable growers in their county or region, in order to determine if it would be likely they would have a grower to work with. Realizing that counties and regions vary dramatically in size and that those not already working in this area might not know the answer, the most common estimate was 2-10. The primary crops grown were (in order of frequency of mention and with the same caveats) tomatoes, cucumbers, greens, peppers, berries, brassicas, herbs, and vegetable transplants.

Ninety-two% were definitely or possibly interested in participating in webinars. All were definitely or possibly interested in the hands-on training. Seventy-eight % might have a grower to participate with them.

Milestone #3 (

3) 20 Extension Educators learn about listserve and web site for resources.

Accomplishments:

We created a list-serve (Greenhousevegipm) through the Cornell University list-serve system for Extension Educators interested in participating in the greenhouse/high tunnel vegetable IPM project. At first, it was only open to those in the project to allow freedom for discussion that might not occur if it was a more public list. However, the participants decided that making it a more public list was

acceptable so participating growers and others interested in the topic have been added over time. There are currently 36 educators and Cornell faculty, and 19 growers on the list. As we hold trainings, others are invited to participate so the numbers will increase.

A Box file, also through Cornell University, was created as a site to house resources related to IPM in vegetable greenhouse/high tunnel production. Currently, there are 70 Extension Educators and faculty on the editor list. While those outside the university system can be included on the list, we believe there are better options for housing this information, which we will look into. Currently there are 97 files in the Box, mostly relating to the webinar topics. Over time, resources presented at the grower meetings will also be added.

Milestone #4

4) 20 Extension Educators attend series of webinars to cover the topics listed in the grant.

Accomplishments:

Based on the topics of interest to educators that were identified in the survey, we created a webinar series held every Thursday noon for approximately one hour. We identified speakers from the project team and Cornell faculty and requested resources from them for the Box file to support their topics.

Feb 2: Introduction to the project – Betsy Lamb

Feb 9 Soilless media fertility/water management – Neil Mattson

Feb 16: In-ground fertility/water management – Judson Reid

Feb 23: Production factors for greenhouses and high tunnels that relate to IPM – Amy Ivy

Mar 2: Disease management in greenhouses and high tunnels – Brian Eshenaur/Amy Ivy

Mar 9: Insect management in greenhouses and high tunnels – John Sanderson

Mar 16: Weed management in greenhouses and high tunnels – Betsy Lamb

Mar 23: How to write/use an IPM plan – Betsy Lamb

Webinars were advertised through the project list-serve and also through another list-serve of Extension educators. They were accidentally advertised to the public, which was picked up by an international greenhouse list-serve, so we included approximately 40 others on a list to be alerted when the webinars were posted on the website.

The webinars were run using the Zoom system, which is supported by Cornell. It is a relatively easy system to use and participants did not seem to have problems connecting. It has a chat function for questions and we always had someone other than the speaker coordinate asking the questions during or after the webinar. At the end, we had the option of opening up the microphones for other comments and questions.

Of the 22 educators participating in the webinars, 12 attended at least half and the average attendance was 3.5. Because of educators' busy schedules and varying experience with the topics, we didn't expect that everyone would attend all of the programs. Therefore, we recorded all the sessions and posted them on the NYS Integrated Pest Management website with public access. They can be found at: https://www.youtube.com/playlist?list=PLoNb8lODb49u_mSvLTTZUGPfn-WTvERV3 This allows viewers to watch them again, but also allows us to use them more broadly. After each webinar was posted, it was advertised through a wider greenhouse IPM industry list-serve so the number of growers who have viewed them may be greater than we can measure. In the future, it would be interesting to have a pop-up survey question to know who is watching and their reasons for doing so.

Number of views as of 12/28/17

Introduction to the project – 200

Soilless media fertility/water management – 97

In-ground fertility/water management – 65

Production factors for greenhouses and high tunnels that relate to IPM – 114

Disease management in greenhouses and high tunnels – 69

Insect management in greenhouses and high tunnels – 131

Weed management in greenhouses and high tunnels – 28

How to write/use an IPM plan – 44

We surveyed those attending the workshop (20 responses) on their opinions on the webinars. This isn't the entire group of educators who viewed the webinars and it could be considered a skewed population as they were interested enough (and had the time) to attend the workshop, but we think the answers are still relevant.

All respondents said the webinars were useful, and had information that was new to them. Most commented that they liked that the webinars were archived so they could review them later. Twenty-five percent participated in the webinars live, 56% on YouTube and 19% both. The fertility topics were considered most helpful, and they liked topics that included on-farm examples. All would like to continue the series, and 78% said they would use the archived versions as a resource for growers.

Milestone #5

5) 15 Extension educators participate on list serve to identify additional resources needed.

Accomplishments:

Since the list-serve was created, there have been at least 46 messages sent out to participants. This includes announcements of meetings that might be of interest to the membership, new resources, and answers to questions posed by the group. We need to encourage use of the list-serve multi-directionally so questions, answers, and resources are posted by a wider group. We will continue working on this in 2018.

Milestone #6

6) 15 Educators and growers attend 1-2-day hands-on workshop to create IPM plans and plan for on-farm demonstrations or tours, complete evaluation of workshop and additional educational needs.

Accomplishments:

The workshop was held April 26-27 with the primary intent being to develop connections between Extension educators, growers, team leaders, and other resource people. We met in Geneva at the NYS Agricultural Experiment Station, which allowed us to interact with some of the local faculty working on high tunnel crops and to visit their high tunnels. In addition to an overview of the project and IPM in high tunnel vegetables, there was an open-ended group discussion on the 'Writing an IPM plan' document. We had asked the participants to watch the webinars if they hadn't attended 'live' so that everyone would have a similar basis of knowledge. The group also toured greenhouses in Penn Yan (Hoover) and Phelps (Fellenz) to see how IPM works in a commercial system.

Not including the project team and the Cornell faculty, 10 Extension educators, 1 Master Gardener and 9 growers attended the workshop.

From the survey, we learned that attendees favorite parts were the ability to interact with each other, having growers attend the workshop, touring farms with the owners available for questions, discussion of the IPM planning procedure, and the accessibility of Cornell staff. Some of the 'Aha!' moments were: the differences between high tunnel and greenhouses and other growing systems, how much work it is to be a farmer, greenhouse/high tunnel construction issues, and water pH and alkalinity. Everyone liked the farm tours because of the benefit of seeing what we were discussing, having the grower viewpoint, the diversity of systems we visited, and the practical application of information. Everyone also appreciated the discussion of the IPM planning document because it allowed for a variety of experience and viewpoints to be applied to the issue, there was an exchange of ideas and lots of input, and because they appreciate peer learning. The educators all liked having the growers participate in the workshop because of their practical knowledge and insights, because of suggestions of topics that would be useful to them, and because it allowed educators and growers to get on the same page. The growers appreciated the ability to attend because of the awesome support, and the wealth of experience and knowledge.

In general, attendees like the session on creating an IPM plan. They loved the format of a written plan and the fact that all the facets were in one piece, and that they could take it home to think about it. They thought having growers and educators brainstorming together made a difference, especially because it was a lot of information and might need specific situations to be able to work through it all. Everyone felt more confident in handing high tunnel pest management questions because they now have resources.

We asked what we could offer to help them in holding regional meetings. They would like help with identifying speakers and collaboration with local agencies, covering some of the costs, helping to coordinate with other regional Extension offices, and our presence as moral support.

Dr. Courtney Weber discussed using high tunnels for raspberry production

Nelson Hoover and Judson Reid discuss using greenhouses for tomato and ornamental production

Discussion from workshop continues on tours

Small groups discuss the IPM planning document

Educators scouting at Fellenz Farm

Milestone #7

7) 10 Educators plan and conduct formal or informal grower training program as appropriate for clientele group, evaluate grower response.

Accomplishments:

To date, educator organized grower training programs have been held in 3 counties. Two others were scheduled but canceled because of the low numbers signing up. We are working on some additional measures to reduce this problem as we continue to work with the educators on planning. Many of the educators that went through the training don't have specific responsibilities for training growers – although they are interested in knowing more about it because the need is there and the county has no specific agriculture educator. So they may not know the growers, or know the best time to hold a meeting. For example, in Wyoming County, many of the high tunnel growers also hay and the date chosen happened to have good weather for haying.

In Oneida County, the program was held August 7 with 25 attending. The group was mostly growers, but a group of agriculture students and their advisor from the local high school also attended. The agenda is appended below. Steve Adamkowksi led a

tour of his vegetable and ornamental high tunnel at Freedom Farm Market. In addition to Holly Wise and Terri Harrison, who are educators in the county, Lilly Calderwood from the Capital District Extension program also attended.

Of the 12 responses on the evaluation, 8 already owned some type of protected growing structure. Tomatoes and cucumbers were the most commonly produced vegetable but growers also produced lettuce, herbs, Asian greens and peppers. One grower already had an IPM plan, 6 use IPM but didn't have a specific plan, 1 used IPM practices but didn't know it was IPM and 2 said they don't use IPM practices. Six indicated they had learned something new about IPM. Seven indicated that there are changes they will make in their production based on what they learned. Most common responses were improved organization and record keeping, using the IPM planning document to create a formal IPM plan, increasing the use of soil and water testing, and increasing scouting and identification of plant diseases. Ten would be interested in participating in a webinar series.

In Tioga County, the program was held October 2 with 12 attending. Barb Neal, Elizabeth Lamb, Judson Reid and Brian Eshenaur presented. Most attendees were growers but the local NRCS representative also attended. We toured Our Green Acres with Keith Slocum, one of the growers who attended the workshop.

Of the 8 evaluation respondents, 6 have some sort of protected production. Tomatoes were the most commonly produced crops, with herbs, peppers and ornamentals following. One grower already had an IPM plan, 2 use it although without a specific plan, 1 used IPM without knowing what it was, and 1 did not use IPM methods. Five noted knowledge gained, including how to make an IPM plan, biocontrol options, disease resistant varieties and managing plant environment for disease management. Six growers plan on making changes based on what they learned, including better scouting, better record keeping, improving ventilation, and increasing use of beneficials for insect control. All would like to participate in a webinar series.

In Putnam County, the program was held October 31, 2017. County educator Jennifer Lerner did a survey of attendees before they arrived. Seven of the 13 attendees already have high tunnels and 4 didn't know what IPM is. Growers produce, or wish to produce, tomatoes, cucumbers, a variety of greens and ornamentals and mentioned a variety of production issues. The program was held at Yarrow Hollow Farm, sponsored by Sarah Lucas, who was a workshop attendee. Both the Putnam County Soil and Water Conservation District and the Natural Resource Conservation Service were involved in the program.

Of the 8 evaluation respondents, grower already had an IPM plan, 3 are very likely to write one, and 4 might give it a try. The 2 grower who didn't already have high tunnels are now more likely to get one. All 8 learned something that can help them extend their harvest season, diversify their crops and better plan for pests. Several

mentioned the importance of environmental control. Seven are very likely to use concepts they learned and 1 might give it a try.

Tour at Freedom Farms

Keith Slocum describes low tunnel system

Raspberries in high tunnel at Our Green Acres

Sarah Lucas describes high tunnel production at Yarrow Hollow Farm

Milestone Activities and Participation Summary

Educational activities and events conducted by the project team:

1 curricula, factsheets or educational tools

3 on-farm demonstrations
3 tours
8 webinars / talks / presentations
1 workshop field days

Beneficiaries who participated in the project's educational activities and events:
36 Extension
4 Researchers
9 Farmers/ranchers
36 Total number of ag service providers who participated in the project

Learning Outcomes

10 agricultural service providers reported changes in knowledge, skills and/or attitudes as a result of their participation.
Key areas in which the service providers (and farmers if indicated above) reported a change in knowledge, attitudes, skills and/or awareness::

Written evaluations were completed by attendees of the workshop and for all three of the county-based grower programs.
Key areas are what integrated pest management is and how to create an IPM plan, environment as a component of pest management, biological control, and resistant varieties.

28 farmers reported changes in knowledge, attitudes, skills and/or awareness as a result of their participation
21 ag service providers intend to use knowledge, attititudes, skills and/or awareness learned through this project in their educational activities and services for farmers

Performance Target Outcomes - Service Providers

Target #1

Target: number of service providers who will take action to educate/advise farmers:
10
Target: actions the service providers will take:

10 of 20 Extension educators who co-train with growers in greenhouse vegetable IPM to provide grower support will conduct educational programming for 150 growers;

Target: number of farmers the service providers will educate/advise:
150

Verified: number of service providers who reported taking actions to educate/advice farmers:
3
Verified: number of farmers the service providers reported educating/advising through their actions:
28

Target #2

Target: number of service providers who will take action to educate/advise farmers:
8
Target: actions the service providers will take:

8 of the service providers will create an IPM plan with a grower then demonstrate it for 160 growers.

Target: number of farmers the service providers will educate/advise:
160
Activities for farmers conducted by service providers:

- **3** Workshops/field days

Performance Target Outcomes - Farmers

Target #1

Target: number of farmers who will make a change/adopt of practice:
30
Target: the change or adoption the farmers will make:
Thirty growers will document an increase in IPM in their vegetable greenhouses.

Additional Project Outcomes

No project outcomes

Participants

Holly Wise
Jennifer Lerner
Keith Slocum
Sarah Lucas
Don Gasiewicz
Michele Lipari